Experimental Probabilistic Quantitative Precipitation Forecasts (PQPF)
Product Description Document (PDD)
December 3, 2019

Part I - Mission Connection

a. Product/Service Description – Experimental probabilistic quantitative precipitation forecast (PQPF) graphics will be posted to the web indicating the minimum, most likely, and potential maximum accumulated precipitation scenarios for the 72-hour (Day 1-3) forecast period. The probability of reaching various precipitation thresholds such as ≥ 1", 2", 4", 8", 16"; plus a table showing the probability of 72-hour precipitation falling within specified ranges and the probability of exceeding specified amounts, will be provided.

b. Product Type – Experimental

c. Purpose – Forecasting of heavy rainfall events remains a major challenge for NWS meteorologists and represents a significant hazard to life and property across many parts of the country. To support the user community and core partners during potential heavy rainfall events, NWS Weather Forecast Offices (WFOs) currently provide deterministic quantitative precipitation forecast information; however, these products do not deliver important information about forecast uncertainty. The purpose of these experimental probabilistic Internet-based products is to provide customers and partners a potential range of forecast accumulated precipitation in order to better communicate forecast uncertainties and enhance Impact-based Decision Support Services (IDSS) for communities sensitive to heavy rainfall events. The probabilistic products will complement existing NWS deterministic quantitative precipitation forecast graphics, indicating areas of low and/or high uncertainty.

d. Audience - The target audiences for this experimental product are customers and partners such as emergency managers, state and local officials including School Superintendents, Departments of Transportation (DOTs), media and the general public. In 2018, the WFOs involved in the initial stage of the PQPF experiment included: Boston, MA; Miami, FL; Melbourne, FL; Wichita, KS; Detroit, MI; Milwaukee, WI and Salt Lake City, UT. In 2019, the PQPF experiment will include those same seven WFOs and three additional WFOs (Blacksburg, VA; Great Falls, MT; and Houston, TX) for a total of 10 WFOs. The links to each of the WFOs are as follows:

Miami, FL – weather.gov/MFL/PQPFTest
Boston, MA – weather.gov/BOX/PQPFTest
Wichita, KS – weather.gov/ICT/PQPFTest
Melbourne, FL – weather.gov/MLB/PQPFTest
Milwaukee, WI – weather.gov/MKX/PQPFTest
Detroit, MI – weather.gov/DTX/PQPFTest
Salt Lake City, UT – weather.gov/SLC/PQPFTest

Blacksburg, VA – weather.gov/RNK/PQPFTest
Great Falls, MT – weather.gov/TFX/PQPFTest
Houston, TX – weather.gov/HGX/PQPFTest

e. Presentation Format – The first probabilistic precipitation graphic depicts the 90% chance of higher liquid precipitation forecast (represented as "Low End Amount"), the Expected Liquid Precipitation - "Official NWS Forecast" scenario, and the 10% chance of higher liquid precipitation forecast (represented as "High End Amount"). The second graphic shows 72-hour precipitation threshold amounts with color curve probabilities from zero to 100 percent. The third product is a text-based range probability/exceedance probability table for specific locations. Please see examples in Part II. All products will be web-based and available on participating WFO web sites.

f. Feedback Method – Feedback will be gathered through representatives from federal, state, county, and local government agencies and broadcast media during scheduled customer review meetings and via a web-based survey linked to the product page:

https://www.surveymonkey.com/r/ExpPQPF

Customer comments or questions on the Probabilistic QPF products may be addressed to:

James Nelson
Weather Prediction Center (WPC)
Development and Training Branch Chief
College Park, MD 20740
E-mail: James.A.Nelson@noaa.gov

The customer comment period runs from September 24, 2019 through July 1, 2020.

Part II – Technical Description

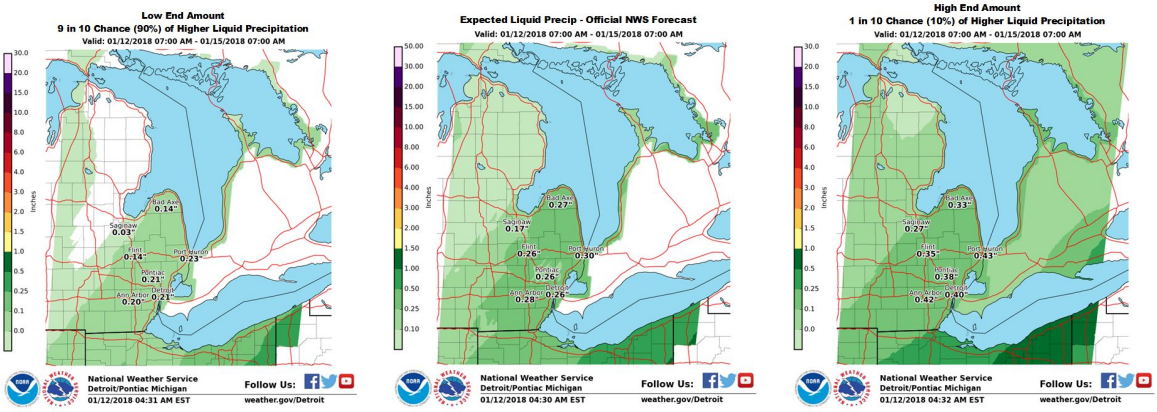
a. Format and Science Basis – The format is described in Part I under "Presentation Format." As for the scientific basis, a 70 member multi-model ensemble will serve as the basis for computing the 5th, 10th, 25th, 50th, 75th, 90th and 95th percentile boundaries of expected 72-hour accumulation, with forecasters adjusting the most likely QPF amount based on experience. A probability density function (PDF) will be created automatically based on these eight reference points, with range interval and exceedance probabilities derived from the PDF.

b. Availability – These products will be available throughout the year and updated 4 times daily. The preliminary Day 1-3 forecast for the 12Z cycle will be available at approximately 0800Z, with the final forecast expected by approximately 1000Z. The

preliminary Day 1-3 forecast for the 00Z cycle will be available at approximately 2000Z, with the final forecast by approximately 2200Z.

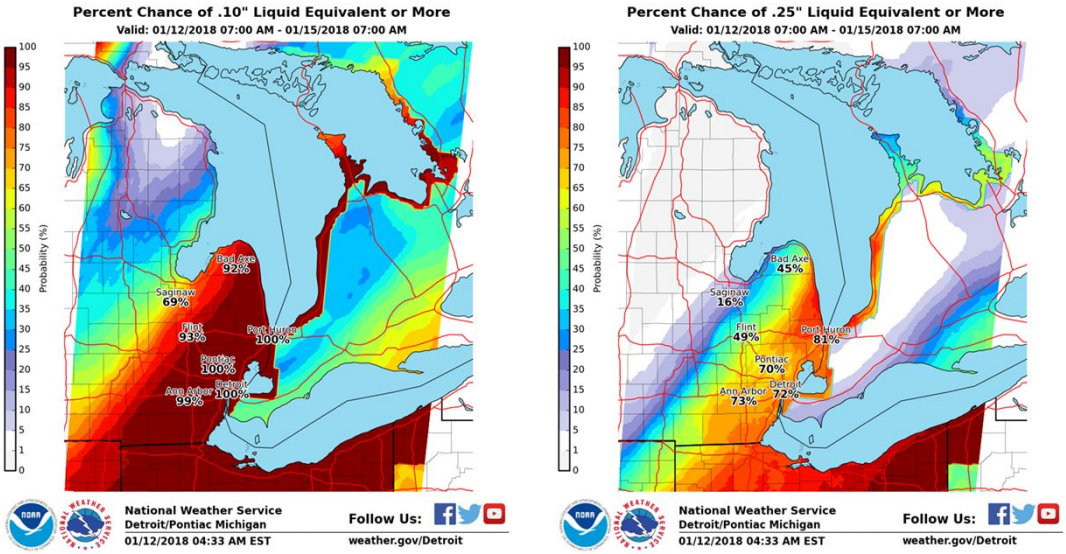
Probabilistic QPF Product examples:

1. The graphic below depicts the Day 1-3 72-hour of the 10th percentile, most likely, and 90th percentile of precipitation accumulation forecasts at the WFO Scale.



A wide range between minimum and maximum precipitation amounts indicates large uncertainty in the forecast. Conversely, a narrow range indicates higher confidence in the forecast.

2. The next graphic would show the probabilities of exceeding certain QPF threshold amounts with color curve probabilities from zero to 100 percent. (example is 24hr PQPF exceeding 1.0")



3. The final product would be a text-based exceedance probability table (Example Table).

DTX Liquid Precipitation Totals by Location

Experimental - Leave feedback

01/12/2018 0700AM to 01/15/2018 0700AM

What's this?

County: Selected

Location	Liquid Precip Amount Potential			Chance of Liquid Within These Ranges									
	Low End Liquid Precip	Expected Liquid Precip	High End Liquid Precip	0"	0.01-.10"	.10-.25"	.25-.50"	.50-1.0"	1-2"	2-4"	4-8"	>8-16"	>16"
Adrian, MI	0.2	0.34	0.45	0%	3%	23%	69%	5%	0%	0%	0%	0%	0%
Ann Arbor, MI	0.2	0.28	0.42	0%	1%	26%	69%	4%	0%	0%	0%	0%	0%
Bad Axe, MI	0.14	0.27	0.33	1%	7%	47%	45%	0%	0%	0%	0%	0%	0%
Bay City, MI	0.01	0.13	0.24	14%	26%	49%	11%	0%	0%	0%	0%	0%	0%
Caro, MI	0.11	0.26	0.32	3%	10%	50%	37%	0%	0%	0%	0%	0%	0%
Detroit, MI	0.21	0.27	0.41	0%	0%	26%	71%	3%	0%	0%	0%	0%	0%
Flint, MI	0.14	0.26	0.36	1%	5%	44%	50%	0%	0%	0%	0%	0%	0%
Howell, MI	0.16	0.27	0.37	0%	4%	39%	56%	1%	0%	0%	0%	0%	0%
Lapeer, MI	0.19	0.26	0.37	0%	1%	36%	63%	0%	0%	0%	0%	0%	0%
Midland, MI	0.0	0.09	0.19	18%	36%	42%	4%	0%	0%	0%	0%	0%	0%
Monroe, MI	0.2	0.3	0.47	0%	1%	22%	67%	10%	0%	0%	0%	0%	0%
Owosso, MI	0.1	0.26	0.31	4%	13%	50%	33%	0%	0%	0%	0%	0%	0%
Pontiac, MI	0.21	0.26	0.38	0%	0%	30%	69%	1%	0%	0%	0%	0%	0%
Port Huron, MI	0.22	0.29	0.42	0%	0%	21%	76%	3%	0%	0%	0%	0%	0%
Saginaw, MI	0.03	0.17	0.27	10%	21%	53%	16%	0%	0%	0%	0%	0%	0%
Sandusky, MI	0.21	0.29	0.38	0%	0%	26%	74%	0%	0%	0%	0%	0%	0%
Warren, MI	0.21	0.26	0.39	0%	0%	28%	70%	2%	0%	0%	0%	0%	0%

Switch to: (•) Range ( ) Exceedance

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